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# Whither the C.64?

**by John King**

The casual observer might be excused for thinking that Commodore is a mite embarrassed by the continuing success of its low-end model. After all, since the Commodore 64 was first introduced some five years ago, the international company has tried to discontinue the line a couple of times, only to bring it back in response to howls of protest from the millions of users – and no doubt countless potential users about to launch into computers.

So what makes the C.64 so endurable?

"Software," says Mike Harrison, consumer sales manager at Commodore Computer (NZ) Ltd. "There's a huge software base for it. The 64's also portable – everybody has a 64 – and it's all sold in cash-and-carry boxes now. Fewer people need training in using it, partly because it's in so many schools."

Then why did the 64 take off when the Plus/4 and Commodore 16, both of which offered good features and seemed to be good machines, didn't?

"I'd love to know."

Predicting which computer model – or even which operating regime – is going to succeed in today's marketplace is akin to forecasting accurately the location and time of the next 7.5 magnitude earthquake. Lots of people would dearly love to be able to do it, and plenty of money awaits the successful soothsayer, but the microcomputer world is littered with machines that seemed brilliant at the time of their introduction but for various reasons failed to make the grade.

A look through the lists of user groups of even a couple of years ago will show brands that appealed to enthusiasts who, after support from manufacturers and distributors dwindled, drifted away to machines that offered bigger capacity or guaranteed compatibility with an industry standard, even if they were far from exciting to use. The MS-DOS world may be dull grey (or an icky shade of beige, depending on which brand dominates the desk), but it does have a very large choice of software, some of which has been made to appeal to those who enjoy a bit of variety and profess to like chasing little arrows around the screen with a plastic rodent.

## Enduring

But Commodore's enduring little 64 seems unaffected by all this. Certainly it was repackaged about 18 months ago into a more streamlined keyboard/box, but the internals remain unchanged and there's more interest in the GEOS – graphic environment operating system to the uninitiated – which now comes bundled with the machine and allows more of its potential to be realised, than in the C.64C itself.

"It's not the toy a lot of people think it is," remarks one confirmed C.64 enthusiast. "It has features not found on a PC, although the keyboard lets it down, not looking like a professional's PC. It's cheap and there are plenty of them about, and it's definitely worthwhile continuing to write software for the 64."

Business software, too, which might confound the critics who see that world as being restricted to nothing less than OS/2 and 80386 or 68020 esoterica. Applications written for the Commodore 64 were entered in the Personal Computing Software Awards held last month, one of them being said by the judges to achieve something that others had failed to do on machines costing ten times as much.

With five years behind it, are there more changes in sight for the 64? "Only cosmetics, if anything," says Commodore's Phil Grant. "We're more into packages, like the Fun Pack and Pro Pack we're selling the 64 in, but there's plenty of third-party stuff in peripherals too.

"The 64's Basic is primitive, but can be upgraded by third-party material. Just about everything made by Commodore has had enhancements by third-party suppliers."

Is the market changing? "The market wants whatever is put in front of it. If there were no Amiga there would be a demand for an upgraded 64, with bigger memory and that sort of thing.

"My advice to people would be a look at software available in the next couple of years. It all depends on what they personally want to do."

try, although the distributor is willing to give demonstrations if called upon and will support the dealers. Technical topics are addressed, such as printer drivers for the Amiga or the Riteman problem with GEOS, but Commodore will usually recommend a dealer who has made a speciality of a particular topic.

Nobody is really certain how many Commodore 64s are out there, although the figures of 7 million worldwide and perhaps 50,000 throughout New Zealand are mentioned, with around 700 schools (half the primary school market) using the machine here. Far less certain is the amount of software available, the usual guess being "hundreds of thousands" of packages, with no master list ever being attempted – and that's not counting the public domain applications.

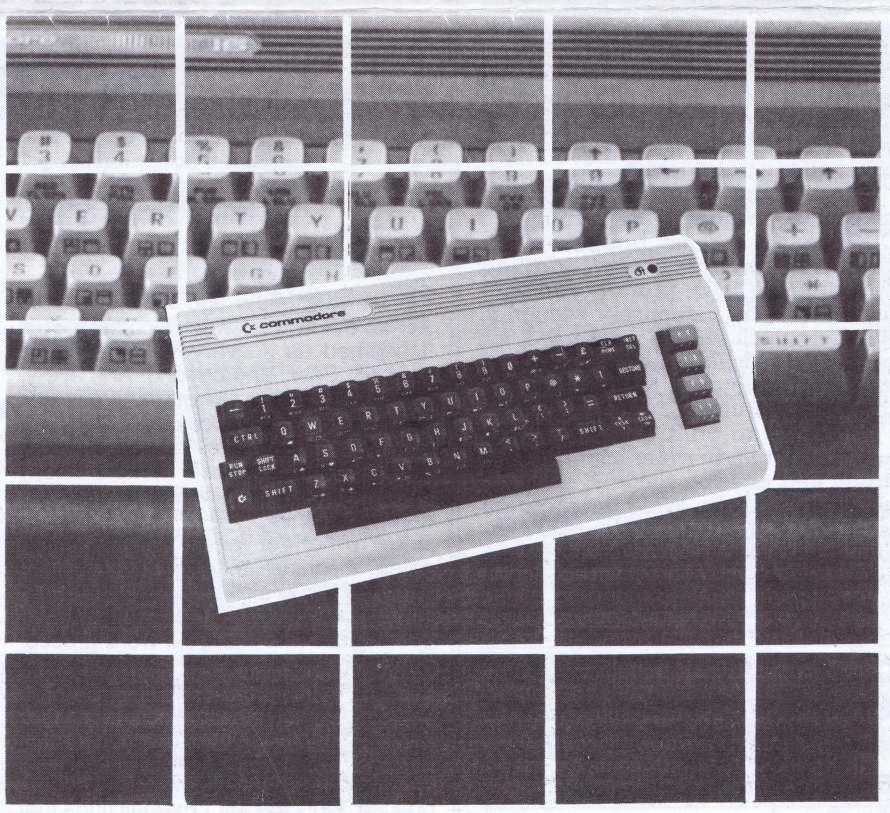
Software is growing ever more sophisticated, too. Arcade games are being transferred to the 64 and kung-fu type games are getting digitised sound. Business simulations are appearing, as well as some applications for straight business use, such as sharemarket analysis and record keeping, and somebody has even developed what is described as a serious CAD package, using the machine's joystick, although that might be stretching the definition of the word to its limits.

The Commodore 64 isn't ideal for everything, of course. The 40-column screen is maddenning for anybody trying to do serious word processing, and the 64kb RAM is a bit limiting for certain applications.

Such shortcomings were addressed by the 128, but that machine is sitting in limbo at the moment, with Commodore unsure of where it fits into the scheme of things here. Priced at not much less than an Amiga 500 which has many more capabilities, but rather more than the 64, the 128D is awaiting some direction from Australia. Still in production and being marketed through Commodore West Germany, it has type approval in the USA where its price structure is different, but the 128D may yet reappear on the NZ market.

But no such indecisiveness is apparent with the venerable C.64. Like it or not, Commodore seems stuck with an apparent anachronism (how many other models of microcomputer are still in production after five years?) which has outlasted many a rival and should continue to be the standard micro for the home user for a while yet.

Will the C.64 be the micro of the 1990s? ■




## Ready acceptance

Nothing seems to be in sight in the way of new hardware from Commodore, and the New Zealand operation is keeping local interest up by introducing such things as the Magnavox Videowriter – the word processor for those who don't like the thought of computer capability – chess sets and calculators. The Amiga is being marketed with a fair amount of success and is achieving something of a cult following, which suggests that it could well find the sort of niche for itself that the C.64 has made in five years of ready acceptance.

Commodore New Zealand professes not to be embarrassed by the continuing success of the 64, although its sales efforts are low-key. Support for users comes from dealers and the large number of user groups around the country, although the distributor is willing to give demonstrations if called upon and will support the dealers. Technical topics are addressed, such as printer drivers for the Amiga or the Riteman problem with GEOS, but Commodore will usually recommend a dealer who has made a speciality of a particular topic.

## Software continuity assured

With the demise of Dunedin's Remarkable Computers in February, the PC-SIG distributorship for New Zealand has been taken on by Mark Bedford, a former Remarkable staff member. He has formed an association with the Australian distributor of the public domain products, which he says brings bulk buying benefits for local members.

Five organisations are reported to have contacted PC-SIG in the US with a view to obtaining the NZ rights. The group started as part of a large micro club to distribute public domain software and shareware, but rapidly grew into a full-time operation and now sends its master sets worldwide on CD-ROM disks.

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# Words about pharmacies

**Public domain software is something of an unknown quantity for many PC users. Certainly it's cheap compared with the usual mainstream package, but does it work reliably and efficiently? Dale Stuart looks at a couple of examples from Select Software.**

Galaxy from Omniverse is a word processor that is claimed to be better than Wordstar, although I presume this does not include Wordstar 2000+.

In looking at the differences between the two, and how Galaxy performs, the first thing I notice is that when the left margin is set at 5, the cursor column shows position 5 whereas Wordstar would indicate position 1. This may come in handy if you like to format your pages to look good, and while it can be a bit disconcerting at first you will soon get to know what is happening.

Galaxy can be started with your favourite file by typing Galaxy <filename>, and F1 brings a Help screen. When I first fired up the program on a Magnum Mark II all the screens came up, but with my own computer I find that I get the first menu listing all the help available, yet when I make my selection nothing happens. The disk accesses, but no screen.

The only thing I can suggest is that I have a very different graphics card. That does make it hard to write this review, so I will stick with the Wordstar commands. To be fair, the commands are in the GALAXY.DOC file on the disk, and all the pull-down menus do work so this is not a great hindrance.

## Faster

Being RAM based, the program is faster than Wordstar, but the copy I received for review did not have the spelling checker available. The reformat paragraph command is different. If you have indented your paragraph and go to reformat it, you will lose the indentation if you place the cursor at the very beginning, while Wordstar seems to know which spaces are put in and reformats accordingly. The wordwrap command is a different way of saying automatic line feed when the right margin is reached.

***The cursor control keys do not obey the margins but are full screen.***

The cursor control keys do not obey the margins but are full screen. If you are at the beginning of the line, using the left arrow key will take you back into the left margin. I normally use the right arrow key a lot to jump from the last of one line to the beginning of the next, but doing this with Galaxy keeps going until you run out of room on the right side. (I gave up at column position 500.)

Deleting a line using Ctrl-Y results in the cursor going back to position 1, from where you have to move to your margin. I didn't discover how to set the justification, which may be a major problem for some people as I personally like justification.

It does, however, have wordwrap. If you use a word processor to do your programming, the document file indicates that you have to use Galaxy with wordwrap Off, since wordwrap does not have a full carriage return (Hex 8D0A instead of 0D0A).

Also mentioned is that all dot commands are shown, if you are editing a WS file, but they are not acted upon. Wordstar sets the high bit in many characters to know what to do for justification and such, and Galaxy will accept these bits as is, so if you fire up a WS document the screen will look funny. Getting rid of the graphics is a matter of pressing Alt-G, when Galaxy will ignore these bits in the editing and printing, so there's no need to panic. I would presume some of the print commands wouldn't work.

I notice that Ctrl-N to insert a line doesn't work. This is not a major problem, but something to get used to if you are familiar with Wordstar.

## Overseas support

Full support is offered through a BBS in Washington State, available only to registered users who have to pay $US35.00 in addition to the $NZ18.00 for the program from Select Software, so right from the start you will be paying about $90. The phone bills make it not worth the money, as speaking from personal knowledge, BBSs are incredibly time-consuming.

However, in summary I found Galaxy to be very satisfactory for home use, for moderate correspondence or personal letters. In the office environment it will be limited, there being no mailmerge as far as I can tell, but once I became used to the program I liked it. For the money this is a good buy.

## For first-time pharmacists

Pharmacy Program for the IBM PC-compatible appears to be written in Basic and parts of it are compiled. The screen layouts are done in a simple way, and while they are not confusing, at times they are *too* simple, and the first-time user needs the manual right there. The manual, on the disk under the heading USERGD.DOC, is very comprehensive and seems to cover all the right details.

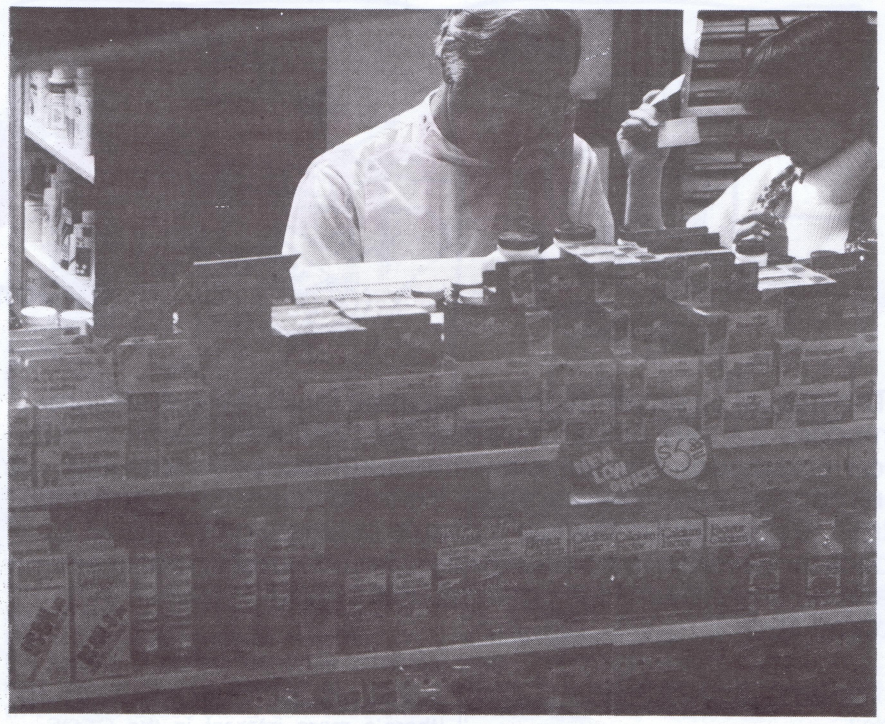
Starting the program is simply a matter of entering MENU from the DOS prompt, which brings up the choices for the Dispensary, Sort and Tidy drug file, Sales printout and Data file editor. The Dispensary section is the one which will be most used, for printing labels and doing such tasks as altering the drug records and entering new drugs.

It is wise to print the User Guide and have it handy when entering new drugs and altering records, as it explains everything. Whie the program is easy to run, a few shortcuts are available to make it run faster, mainly to save keystrokes when printing labels.

***It is wise to print the User Guide and have it handy when entering new drugs and altering records.***

Selecting 3 to print labels from the Dispensary menu brings up queries on the drug code and quantity, then three lines of instructions labelled To Be Taken. These lines are centred on the labels, making a nice neat touch. The user is then asked for the patient's name and how many labels are to be printed. The date is automatically printed, but there is no place to put the doctor's name, which could be a major problem, but it could always be printed on the third line of the label.

I found this program to be very useful for printing labels. There is a sales record printout of drugs used, but it is rather limited in scope. It also has one major fault: it prints a drug on only every third line, in the format drug, underline, space, another drug, which can waste paper. The report is laid out neatly and is easy to read, but one-third of the paper is wasted. Perhaps the way around that is not to do a report...



If you have a pharmacy and computer but no pharmacy program, this may be the answer. It's a low-risk option to discover the needs and time savings, but it would be hard to justify a computer to do only labels and warnings, and it should also be able to do word processing and accounts. The program is well written, with the only potential problems in label printing being no doctor's name and no space for number of refills, both of which could be put on the To Be Taken lines. ■

*Galaxy and Pharmacy Program at $18.00 each. Review copies supplied by Select Software, Nelson.*

# A bad spell of whether

## by George and Eileen Anderson

Twelve months ago we didn't even known how to switch a computer on. It seemed as if everyone else was a whizz at Basic and beyond. And everybody – except us – wrote their bits and pieces on a word-processor.

Now – a little late, maybe – we've joined the human race with an elderly Epson QX-10. And are actually learning to drive the thing.

We're not yet ready to give complicated machine-language-type advice, but we'd like to make a little comment to all you people who use some form of spelling checker with your word-processing program.

Spelling checkers have a few blind spots. They can't tell if you've used an okay word in the wrong place. For instance, type in "Goldilocks and the Three Bores" and your mistake goes unnoticed. Only the Mk.I Eyeball finds that one.

But there are similar, more common, mistakes that can be picked up by your spelling checker if you use a bit of thought. Especially words like "its" and "it's". "There", "their" and "they're". "Practice" and "practise". "Your" and "you're". And so on.

Put them in the wrong place and no electronic hoodacky will ever tell you. And they won't exactly stick out like a store thumb when you're proof-reading, either.

So?

If your spelling checker has a Delete Word feature, cut the words mentioned above out of your dictionary file. When you run the checker on a document, they'll come up as errors. Tag them, and use Search in edit mode to see if the right word's in the wrong place or not.

It won't take a moment, and nary a one will be missed.

And a point that's probably obvious to everyone, but is a real beaut of a time-saver...

Perhaps you're writing a play and have to type the same two or three characters' names time and time again. Or you're writing a letter to the manufacturers of polypropylene stackable chairs – and have to mention the darn things in each paragraph.

Don't.

Use a simple code, such as AA, BB and CC for those people in the play. Or * for the unpronounceable chairs. And when the play or the letter is finished, use Multiple Search And Replace to automatically substitute the name or phrase for the code you've chosen.

A double letter is best, as it won't get confused with a real word. And don't forget the thing to look for is "space-B-B-Space", otherwise you might find odd things happening in the middle of words like "cabbage" and "rabbits".

Perhaps you're wondering how this would work with those poly-whatever chairs if they came at the start of a sentence and needed a capital. Dead simple. Set Search to look for "space-space-code-space". After all, the only place you'd have a double space before your code is at the beginning of a sentence.

Before you use this method, play around with it on a document file that isn't very important. It can be worth finding out just how long a string you can replace your code sign with.

We can – using Peachtext – get nearly 80 characters into our replacement. And if there's a need for special characters in the string, we can even include the equivalent of block marks, returns and page feeds. So a full-blown, neatly set out address can be swapped for just a couple of code letters. ■

# Who's afraid of the big bad computer?

by Tim Hartnell

*Part II*

## Microsoft Windows

With this program running in your computer, you can work with several other programs at the same time, so you can have for example Lotus, dBase III and Word running in different windows on the screen, allowing you to switch at will between them. And when you move to another program, you do not have to Quit the program you have been using. Its action is simply suspended until you decide to go back to the window which contains it. When you return to it, it picks up at the exact spot where you left it.

You can also transfer data from the application programs you're running, and incorporate them into Windows desktop applications. For example, spreadsheet data can be incorporated into memos created with the built-in notepad program.

Like the Macintosh menu system, Windows provides an easy method for running your applications, including drop-down menus, and the choice of using the keyboard, a mouse, or both together.

The program comes with a number of built-in applications. I have briefly mentioned the notepad. As well, Windows has a rolodex-like filing program, an appointment calendar, a clock and calculator, a terminal program, and even the game Othello. As well, you get the word processor Windows Write and the Leonardo di Micro program Windows Paint.

The Notepad is a primitive text editor you can use to create, modify and display text files. Although it is designed primarily as a place to jot down notes or short memos, you can also use it to create and edit batch files (batch files really belong in the world of A>, but you can learn to live with, and profit from, them).

The Cardfile is, as I said, an electronic rolodex which you can use to keep track of names, addresses, phone numbers, directions or anything else you want quick access to. Cardfile is really a set of index cards with the extremely useful skill of being able to sort themselves.

The Terminal allows you – if you have the right leads and so on – to connect your PC to other computers, or to online information services and bulletin boards.

The Calender is a combined calendar and appointment book, although I secretly doubt it will be used as a replacement for good old-fashioned paper diaries. You can maintain more than one Calendar file at once, with different files for different people, or for different tasks. You can even set alarms within the program to remind you of particular appointments.

Calendar gives you what the manual grandly calls "two views of time". In the day view you enter, display, or edit your appointments for the day. In the month view you select the day for which you want to see appointments.

The Calculator is pretty obvious, being an electronic representation of a simple calculator, with memory. The Clock draws an analog clock face on the screen, complete with sweep second hand. You can shrink it down to the size of a postage stamp, and leave it running away quietly on-screen all the time.

So, that's the built-in Windows applications programs. The two major programs which come 'free' with Windows itself are Windows Write and Windows Paint.

One good thing about icon-based systems, whether you're using a Mac or a PC under Windows or GEM, is that once you're familiar with the way the thing works – the drop-down menus, the mouse, and so on – you'll find you can quickly discover how to use new programs, with practically no learning. Once you've become familiar with the interface, you'll find you rarely have to even refer to the manual, even when starting with a new program, in order to run it.

This is especially true for the word-processing and painting programs which come with Windows.

## Windows Write

Windows Write runs in the Windows environment, so the program allows you to pass information or graphics from other applications into Write documents. It gives access to two different type faces (helvetica and courier) and allows you to use these as normal, bold, italic, underline, superscript or subscript, in various sizes. The text can be justified, and centred or printed flush to the left or right margins, and can be single, double or one-and-a-half lines spaced. If you do not already use a word processor, you may well find that Windows Write is more than adequate for most of your needs.

The Windows Paint program is a tool which allows you to create, enhance, save and print artwork. Options allow you, for example, to zoom in on a tiny part of the picture, modify it, and then go to the full view again. You can also transfer text and graphics from other programs to modify them in Paint, and you can pass Paint creations to other programs, such as the Cardfile.

So, all in all, you can see that the Windows suite of programs gives you a pretty hefty meal to start with, and provides an environment within which you can run all your current and future programs.

Let's see how it compares with Digital Research's GEM.

## The GEM collection

The heart of GEM is the Desktop, which provides the framework within which the rest of the GEM programs reside and operate.

As with Windows, you can call up, and operate, other programs from within GEM, but unlike windows there is no facility for having more than one program resident at any one time. However, you can 'paste' data and pictures from one program to another, so GEM Draw pictures, for example, can be called up to incorporate into a GEM write document.

The opening screen shows an icon for each disk drive, and a trash can. The Desk menu gives access to a clock and a calculator, which can be moved to any position on the screen. The Collection comes with the Desktop, GEM Write and GEM Paint. We'll look at these programs now.

## GEM Write

This program was designed from scratch to incorporate text and graphics, so it does this more satisfactorily than some programs which were initially written only to handle text, and then modified to allow graphics to be brought in.

You can write and then edit your text either by choosing commands from drop-down menus, or by entering commands from the keyboard. The program displays page breaks and type styles (as well as effects such as underlining, bold and italics) on the screen, which means you have a proper representation of your finished document, before you print it.

The software supports just about every printer on the market, and many plotters, from standard dot matrix printers, to the Apple LaserWriter and the Hewlett-Packard LaserJet. Depending on your output devices, you can produce your work in black-and-white or in colour.

## GEM Paint

The second of the two programs provided with The GEM Collection is Paint, which will allow work in colour if you have an enhanced graphics adaptor, or in black-and-white with a standard graphics card in your PC.

As with most other on-screen painting programs, a number of tools are provided for you to use, including a paintbrush, a pencil, a spray can (great for graffiti!) and a paint tap, to fill an enclosed area rapidly and accurately with a colour, shade or any one of the 21 pre-programmed patterns.

You can move items around on the screen, or produce rectangles and ovals as fast as you can move the mouse. A microscope facility (the equivalent of the Macintosh's quaintly named Fat Bits) allows you to zoom in on your picture to work on fine details.

GEM Paint also allows you to add words to your pictures, in four type styles and six sizes from 10 pt to headline-like 72 pt.

## GEM Draw

If your drawing needs are more for technical illustrations, you'll probably find the Draw package, available separately, but needing the Desktop in order to run, more to your liking.

You create pictures by selecting picture elements (such as lines and boxes, circles, polygons and arcs) from a menu, or draw freehand in a variety of line styles and widths. As with Paint, you can add text at any point in your picture, simply by positioning the cursor with your mouse, and then typing.

With GEM Draw you can select a picture from one window, and then 'paste' it into another picture you're working on in another window. You can use your own graphics, or choose from over 40 pieces of pre-programmed artwork in the picture library which has been provided with Draw.

## GEM Graph

This program is designed to produce presentation graphics. You can design and present your graphs in such forms as pie chart, bar graph, line graph, 3-D bar graph, area graph, bar and line graph, map chart or symbol graph.

As with the other packages, GEM Graph provides many lines, patterns, type styles and colours which you can use to enhance your graphs. You can also add comments anywhere on the graph, and move labels and legends to suit your needs. You can enter data directly from the keyboard, or pull it in from a variety of spreadsheet and database programs, including Lotus, SuperCalc and dBase III.

You can also use the program to set up a sort of slide show, so a series of graphs is displayed at specified intervals for demonstrations and presentations. In addition, you can place two or more graphs on one page.

## GEM WordChart

Finally, in this brief tour of GEM programs, we'll look at WordChart which is designed, as its name suggested, to organise words into charts. Instead of simply having words simply printed out, for such things as an agenda or menu, this program assists you in placing them on the screen so they will create the maximum possible impact.

The program comes with a number of preprogrammed formats into which you can 'pour' your text, or you can create a format from scratch, to produce documents or overhead transparencies. And once the words are in place, you can either surround them with ready-made borders or create your own borders with GEM Paint.

The idea is that once you have your text in place, you should play around with titles and footnotes, font styles and colour (if you're using an enhanced graphics board) until your brilliant creation is just as you want it. The final chart can be incorporated into documents prepared with GEM Write.

## In conclusion

In this aticle we've discussed the fact that user-friendly interfaces, in the style made popular by the Macintosh, are now available for the IBM PC family, close clones and compatibles. These interfaces mean it is now possible to work your PC without ever coming into contact with the dreaded A>.

You've probably realised by now that there is no point in buying both Windows and GEM. While Windows gives you an overall operating system which you can run in the foreground all the time, GEM is really only at its best when running other GEM programs, although there is no reason why you cannot have the Desktop resident all the time, and slip in and out of your other programs using it, and thus ensure that you and A> never meet face-to-face.

I suggest that the only way to choose between them is to ask to see them in action at your computer dealer. Both have strong points to recommend them, and it really is a matter of taste. I use the GEM collection myself, rather than Windows, simply because when I wanted to hit the icon trail, GEM was the only product available. And, like most people, once I've learned to run one software package, I'm reluctant to change horses in midstream. If Windows had come along first, the story would probably have been the other way around.

If the fear of A> has been keeping you at the mercy of your dp department, icons and meece now hold the keys to your salvation. ■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# Catching up with the user groups

## One in every 300 Kiwis is a computer enthusiast – go for it!

**by Alan Bibby**

A three-year research project, studying adult education in computing, has been carried out for the NZ Council for Education Research (NZCER) by Dr Barbara Bibby. Part of the project was two surveys of computer user groups conducted three years apart, at the end of 1984 and 1987. The first survey was written up for *Bits & Bytes* by Shayne Doyle, and further questionnaires were sent to all user groups which had replied previously, as well as to other groups in the latest directory (December/January *MicroBYTES*).

The first thing that struck me when I looked at the huge pile of letters and questionnaires was that the NZ Amiga User Group had more than 250 members *more* than the next-biggest group, the Wellington Atari Computer Enthusiasts (WACE) with its 150 members.

I did some investigating of my own, and found these Amiga 2000s are really something! Fantastic graphics and sound, and if you join the group you are in contact with 43 overseas groups as well. This is my choice, but a very close second in my opinion is the Atari ST series. In 1986 the WACE group had 207 members, but because of the absence of a retailer in Wellington numbers have dropped to 150. Even so, they have certainly been busy, with a huge library of Public Domain software to be used.

In this second survey we wanted to get a general idea about changes in the past three years in the world of User Groups. We asked first for estimates of membership numbers from 1981 to 1987, and second for comments on five major findings of the 1984-85 survey. Details of this work and *Three Years of Adult Education in Computing in New Zealand* have now been submitted to the NZCER for publication, but here are the most intersting results.

### Membership numbers

Table 1 shows the membership numbers. As can be seen we received only 25 replies (compared with 65 replies out of a total of about 100 groups listed by *Bits & Bytes* in 1984-5); we also got 13 envelopes marked "return to sender". We grouped the 25 so that those coded "R" in Table 1 are those now in recess and those coded "E" are branches of the NZ Computers in Education Society (NZCES). "-" indicates no members; "?" indicates not known.

Of the earliest groups, we have these comments:

- One was a hardware group which "peaked in 1985 when semiconductor prices were very low, allowing systems to be constructed cheaply";
- One was a TRS-80 Group, an early model of home computer;
- One was as general sort of computer interest group, not machine specific.

Many clubs had their peaks in 1983-1984.

Some of the clubs that went into recess made no comment, but one said, "Too many people were just playing games, mainly school pupils on Apple IIs. This put older people off attending because of disruption of serious discussions." Another group commented, "Almost everyone has gone to more powerful machines."

It seems a good guess that there are about 50 people on average per group (not necessarily the same people each year however; for example "half of our membership changes quite rapidly"). With about 100 user groups there are at least 5,000 active computer enthusiasts in New Zealand at any given time over the last four years, and probably twice that number of people have been involved "some time". That makes 10,000 enthusiasts out of three million people, so...one in every 300 Kiwis is a computer enthusiast... go for it!

Our figures in Table 1 don't show a decline in numbers of enthusiasts, but perhaps the number of *clubs* has dropped (remember our 13 "return to senders"; how many new clubs have started, to balance those in recession?).

### Comment on earlier conclusions

We sent a covering letter and asked groups to comment on our conclusions from the 1984-5 survey:

***1. The central aim of most User Groups is the provision of information services and resources for their members, drawing on skills from within and outside the group. They allow members to meet people with similar interests and to pool resources. They therefore play an important educational role among members.***

In general, "this would be a good description of our group", and "there has been no change in central aim which is provision of information and pooling of resources". Also, "this is our foremost activity as in the area there is no other support, and dealers only want to sell computers." "Within the computer group there is a mixture of novice computer users and knowledgeable members. Novices often seek and receive useful advice. Sometimes even the experienced computerist can have problems." Also "our aim is to share software and offer help. The amount of help needed has reduced but the software exchange continues." And, sadly, "aims still the same but not so many to aim at".

The CES societies are explicity educational. "Our most useful function is still to help each other, keep up with changes in hardware, software, philosophy, teaching practice, etc." Also, "initially about 10 secondary schools started the group going. 1986 saw an influx of primary schools. We are hopeful that they will continue to enter the society." Echoed by "... larger percentage of primary new subscribers".

***2. Some groups run displays and exhibitions to educate the general public.***

Some groups say yes. From Dunedin Atari users: "We have successfully run two displays in the last two years", and from Central City Computer Interest Group: "Since 1986 we have been running an annual Computer Expo in Dunedin in conjunction with other computer groups, with attendances of over 400."

However, Waikato Spectravideo Users Group did "try it but found it was only the kids who want to play games. This turned the adults off asking questions." The Southland Micro User Group held "an open day on 27 April 1985. Despite newspaper and radio advertising only 60 people attended. Seventeen computers were displayed and members discussed their uses with the public."

### International conference

On a very positive note, the NZ Amiga User Group is "planning an international conference in NZ in October 1988".

Other groups say, "We have not, do not and probably will not run displays and exhibitions: group resources too small for this." And, "We have unfortunately never had a decent opportunity to do a public display. However I'm sure we will get some better opportunities in the future."

And from the Epson Personal Users' Group, "We don't run displays etc but do have a chatty and hopefully informative newsletter each month. If you are on Starnet I should be pleased to add you to the E mailing list."

The NZCES has run two national conferences (August 1985 and 1987), both of which were very stimulating to all delgates.

***3. The NZCES (Computers in Education) societies are specifically concerned with computers in education.***

Replies were received from three branches of the NZCES. For example, "We help introduce people to computers in education. Then as they become more competent and confident they tend to drift away from the society."

Other groups had some comments on computers in education. For example the Poly Users Group, run from Wellington Teachers' College, has committee representation on NZCES, writes to all users, mainly in schools, and runs Freepool, a software exchange system. Some machine-specific groups commented that there was a lot of educational software available, and some said that many of their members were school pupils. Amiga "offered to hold displays at primary schools but these have usually been met with cool response".

***4. There is some concern about ethical use of computers and information.***

One group said, "Our discussions have always been wide-ranging, but we have never discussed any concerns about computers and use of information."

Other comments were: "Our immediate ethical concerns are probably limited to ensuring respect for copyright", and "The first move of the new committee was to stop all club-condoned pirating. That is now a no-no." In contrast, "There is no concern about ethics generally as members will not access other peoples' private mail, probably would not enter a business database but see nothing wrong in pirating software." But compare this comment: "Whenever computers or any other sensitive material is used in business or commerce there will always be someone who abuses the system."

It was also remarked, "We are concerned with ethical use of computers and officially frown on software piracy and try to dissuade it. We are also careful who gets info on membership etc." (This concern for security is one of the factors why this survey is less than comprehensive, as user group addresses are not always publicised.)

***5. At the time of the 1984-5 study, modems/bulletin boards were being introduced in many groups; where are they now?***

Replies ranged widely. For example, "Some members have modems but this has not yet been organised into a cohesive club activity", and "We have produced and sold kitset modems." One club is "thinking about providing a bulletin board facility", and "We are in the process of establishing a bulletin board and are gathering hardware to run one and someone who is willing to look after it."

Problems: "Initial problems with low baud transfer rates now being overcome and greater interest now being generated."

Some success stories: "We have set up with the NZPO/Telecom a forum called COMMUNIQUE. This is a subgroup of Starnet." And "In 1984-5 the University of Otago provided us with the facilities to set up a bulletin board which does receive a lot of use."

### Changes and trends

We also asked for any general comments about changes during the last

three years, trends in the direction of users groups and current enthusiasms. Some replies were:

"Most user groups have had and are going through periods of decline (upgraded computers etc) and the needs of the end user are changing as they seek to 'do more' with their computers."

"Newsletters are still produced but now quarterly rather than monthly."

"Nobody supports our type of computer now, nor is there a service agent. I expect the group will be laid to rest shortly."

"We are going through an interesting period at the moment with the 16-bit section slowly growing with all the probability of an eventual breakaway from the parent user group."

"A growing interest is being displayed in using computers for administration purposes (secondary schools largely)."

"We have the largest and most active group in New Zealand with committee members travelling overseas for more experience."

Having read all this information about user groups, what do *you* think about them? I feel that they are doing a grand job and that I enjoy our own club meetings where there is more to do than just play games. I enjoy talking to other people who use the same machine and getting ideas from them.

But user groups depend on people and their own interests, and that's why they sometimes come and go as people change, and will grow the more the computer and the people have to offer. ■

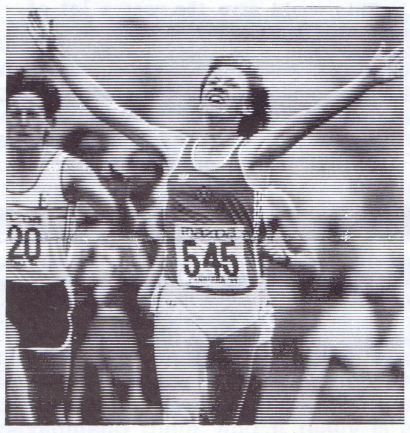
*Thanks to all the user groups who wrote to us, and thanks for the newsletters!*

**Table 1: Membership estimates as supplied by User Groups**

| Number | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|---|
| 1 | – | – | – | 15 | 60 | 65 | 76 |
| 2 | – | – | 9 | 26 | 42 | 63 | 94 |
| 3 | – | – | – | – | 25 | 60 | 40 |
| 4 | 45 | 50 | 60 | 65 | 50 | 30 | ? |
| 5 | – | – | – | ? | ? | ? | 25 |
| 6 | – | – | 50 | 50 | 50 | 45 | 40 |
| 7 | – | – | – | – | 30 | 40 | 50 |
| 8 | – | – | – | ? | ? | ? | 25 |
| 9 | – | 40 | 100 | 120 | 140 | 50 | 20 |
| 10 | – | – | – | – | 28 | 64 | 22 |
| 11 | – | – | – | – | 52 | 38 | 34 |
| 12 | – | – | – | – | – | 130 | 400 |
| 13 | 60 | 80 | 90 | 90 | 80 | 70 | 80 |
| 14 | – | – | 8 | 16 | 13 | 7 | 3 |
| 15 | ? | ? | ? | ? | ? | ? | ? |
| 16 | 50 | 80 | 100 | 150 | 150 | 100 | 50 |
| 17 | ? | ? | 80 | 110 | 180 | 207 | 157 |
| total | 155 | 250 | 497 | 642 | 900 | 969 | 1116 |
| average | 52 | 62 | 62 | 71 | 69 | 69 | 74 |
| R1 | – | 8 | 10 | 0 | 0 | 0 | 0 |
| R2 | – | – | 100+ | 70 | 40 | 30 | – |
| R3 | – | – | – | 80 | 200 | 200 | – |
| R4 | – | – | – | – | 30 | 60 | – |
| R5 | – | ? | ? | amalgamated with another group | | | |
| total | – | 8 | 110 | 150 | 270 | 290 | – |
| average | – | 8 | 55 | 78 | 90 | 97 | – |
| E1 | – | – | – | 30 | 40 | 50 | 50 |
| E2 | – | 40 | 50 | 60 | 90 | 90 | 90 |
| E3 | – | – | 10 | 15 | 15 | 22 | 23 |
| total | – | 40 | 60 | 105 | 145 | 162 | 163 |
| average | – | 40 | 30 | 35 | 48 | 54 | 54 |
| **Total** | **155** | **298** | **667** | **897** | **1315** | **1421** | **1279** |
| **Average** | **52** | **50** | **55** | **64** | **69** | **71** | **71** |

# Ready... set... load!

by Timothy Howell



The crowd holds its breath as the runners line up at the starting blocks. Muscles flexed, the athletes position themselves awaiting the bang of the starting gun. The starter tells them to get ready, then pulls the trigger.

The runners are off! The crowd screams support to the runners as they sprint down the track. About ten seconds later the race is over, the crowd quietens down, and the whole race is nearly forgotten ten minutes later except, perhaps, for the memory of who won.

Instead of having only a few moments of excitement from an event that may happen only once every four years you, with the help of your Commodore 64, can relive the excitement and drama of such competitive sports in the comfort of your own home – not as a spectator, but as an athlete!

Just about all of the major sports have been competently programmed on the C64 and in this article I intend to give a rundown on some of the sports simulations that are worthy of participation.

The whole idea of using a computer to compete in different events really came into prominence when Konami's arcade game Track and Field became popular. this, coupled with the rise of home computers and games machines, eventually resulted in a veritable plethora of sports games being produced.

The first two games on the C64 which were responsible for the wave of athletic simulations were Ocean's Daley Thompson's Decathlon and Activision's imaginatively-named Decathlon. Both featured events such as the 100-metre sprint, hurdles, pole vault, shotput, high jump and javelin. Although they were not especially spectacular, they made up for this in popularity.

When the American company Epyx released its Summer Games it set new standards in graphic quality and presentation, not to mention the quality of the events themselves. Up to eight people could compete in eight different events, including diving which was a new event as far as sports simulations were concerned. About 18 months later Epyx surpassed itself again by producing Summer Games II which had even better graphics and playability. This software wonder also consisted of several different events, some of which were unique to this program, including rowing, equestrian, kayaking, cycling and fencing. The variety of the events was tremendous and they all added up to a very enjoyable package.

By changing seasons, Epyx opened up several more channels for entertainment. Winter Games tried to capture the thrills and spills of the Winter Olympics. Once again the graphics and presentation were outstanding, as was the gameplay and the variety of the events. Because the winter events had not really been programmed to good effect before, virtually all of the events in Winter Games were unfamiliar to the gameplayer, and included the ski jump, figure skating, speed skating, biathlon, bobsleigh and the hot dog aerial manoeuvres.

Epyx continued its Games series by releasing World Games and, more recently, Californian Games. These two packages broke away from the traditional style of such packages because they contained apparently unrelated events that weren't peculiar to any sporting area.

## Tossing the caber

World Games is made up of event taken from around the world. While some such as the cliff diving, weightlifting and the slalom may be relatively familiar, other such as the caber toss, log rolling, bull riding, barrel jumping and sumo wrestling are definitely different. These events use some more complicated joystick movements than the previous Games, but what makes up for this is the very amusing things that happen if you do something wrong. For instance in caber toss, if you throw the caber into the air and it lands on you, you are slowly pummelled into the ground like a hammer hitting a nail.

The latest in the series, Californian Games, is even stranger because of the events it consists of. The events are very informal and are made up of pastimes that are presumably common in California. Flying discs, skateboards, surfboards, roller skates and BMX bikes all play a part in this package, as does a foot bag which is juggled by a figure using various parts of his body. Needless to say, the graphics, animation and presentation are once again excellent.

The good thing about the Epyx series is that they are not 'joystick busting' games. All events use reaction or steady and rhythmic movements which is unlike many of the earlier games that came out. One problem is that they have to use a multiload format as the events take up a lot of memory, which is especially cumbersome for tape users as some fast forwarding and rewinding is often required, and that takes time.

I have concentrated on the Epyx series of sports games because I think they are some of the best sports that have been coded on any computer. However, Epyx is not the only company which has produced athletic-related games of quality.

Imagine in 1985 released an arcade conversion called Hypersports, which was not only accurately converted from the arcade mode but is also an enjoyable game to play in its own right. It consists of several events such as swimming, skeet shooting, vaulting, archery, triple jump and weightlifting. All of the events are fun to play, even if a couple of them require a bit of frantic joystick waggling.

On a lighter note, Gremlin Graphics has recently released the humorous Alternative World Games which is a form of parody of the whole Games genre. In this series you compete in such events as the sack race, plate-balancing, boot throwing, river jumping, pole climbing, running up a wall and a pillow fight aboard a gondola. The graphics and animation are very good and the music and sound effects are just above average.

International Soccer has long been regarded as the definitive game as far as soccer simulations are concerned, written by Andrew Spencer for Commodore around 1982. No other soccer simulation, until recently, could closely compete with it. It was not advanced technically, but it offered simple fun against another person or a variable computer opponent. After International Soccer was released, Addictive Games released its Football Manager in which the player does not actually compete but rather manages a team in the British Football League fourth division, with the objective of getting into the first division and winning the FA Cup. You participate by choosing which players play, buying and selling players and many other managerial functions.

When the World Cup soccer tournament came in 1986, US Gold tried to cash in on the event. Unknown to many at the time, they used a mediocre game put out earlier by Artic and changed it around slightly. The result? Also a mediocre game. It did sell in large quantities mainly (hopefully) because of the excellent packaging that came with it, which brings to mind the saying "don't judge a book by its cover", or words to that effect.

So far this year two excellent soccer games have appeared. Ocean has released match Day II which, through a series of menus, allows the player to change tactics to affect the game. Various kicks and actions have been implemented and a kickometer measures the strength of the kick. All the rules are catered for, but there are no fouls.

Gremlin Graphics has released Gary Lineker's superstar Soccer which is similar to match Day II in that you manage your team and change tactics, but the overall gameplay is not as effective or satisfying. Both games have effective graphics, but Match Day II has better sound.

There are many different sports games available for the C64. I have tried to cover as many as I can and I have also tried to describe the games which I think are the best. In the next couple of months I will try to cover the remaining major sports games available including basketball, boxing, golf, baseball, American football and cricket. ■

# OPIX OPIX OPIX OPIX OPIX OPIX OPIX OPIX OPIX OPIX OPIX

OPIX (OPus Information eXchange) is a sample of the interactive Technical Forum now running on the Auckland based NZ MICRO OPUS Bulletin Board System. Note the new number 468-315, 300 to 2400 bps (24 hours).

++++++++++++++++++++++++++++++++++++++++

TO: All
FROM: MM
SUBJECT: BBS styles

I am currently writting my own BBS software, with the idea of opening it up to the public (ie YOU!). I would like all your ideas on what the ideal BBS would look like. Especially:
- is menu driven better than command driven?
- should message numbers keep going up and up or should they cycle (as I have seen on some other boards)?

Any other comments or ideas that you have on the 'ideal' board would be most welcome.

---

TO: MM
FROM: RH
SUBJECT: Ideal BBS

I like as little time as possible to be spent on pretty formatted lines and long messages between commands(still using 300 baud). I prefer menus to commands on BBS's because of the shorter learning curve. Cross referencing of replies etc is neat.

---

TO: MM
FROM: CM
SUBJECT: BBS's

'MAIL-WAITING' prompt on log-on would be a bonus, as is the system on 'When' saying which forums have new (unread) mail. This would save the user a lot of time in that when I log on OPUS, I check out about 6 of their forums, most of which don't have new mail, but which I check just incase I have missed something. Good luck with your BBS.

---

TO: RH
FROM: MM
SUBJECT: Speed

Well, command driven is pretty fast (especially if you are using 300 baud), but you do have to remember the commands, as you have pointed out. Thanks for the comment.

---

TO: CM
FROM: MM
SUBJECT: Mail

Thanks for the comments on an E-mail system. You have some good ideas there and I will try to implement them on my BBS.

---

TO: MM
FROM: BS
SUBJECT: BBS

The ideal BBS system has a specially written terminal emulator program for the users. This way you can make it a command driven system but each time the BBS is waiting for a command, it sends an escape sequence to the user's terminal program that pops up the list of commands in a menu format. (best of both worlds eh?)

---

TO: BS
FROM: MM
SUBJECT: Perfect BBS

I have heard that somewhere before... but can't remember where. Yep, that sure would be a pretty fast and friendly system, but it would be limited to those that could write their own comms software to take advantage of it. Nice thought though.....

---

TO: MM
FROM: BS
SUBJECT: BBS

Why not write the BBS so that it will work with or without the special terminal program on the user's machine. ie: when they first log on, the terminal program sends an escape sequence to the BBS to say "I'm a smart terminal" and from that point on, the BBS assumes that the user has the pop-up menus. Any user without the smart terminal program will simply receive the standard menu transmitted by the BBS.

---

TO: BS
FROM: MM
SUBJECT: Smart BBS

Now that would be an idea... but first things first. I have to get it running as a normal BBS first, but I shall definitely remember your suggestions for the future.

---

TO: MM
FROM: SYSOP
SUBJECT: Smart BBS

The OPUS system we installed in mid January does just that! It will use ANSI (VT100) codes when you set the G)raphics ON. If your system cannot use them then they are best left OFF otherwise you will get ANSI garbage all through your messages. We do pay a price for this though, each ANSI command has between 2 and 50 characters so this will slow the transmission of readable characters down quite a bit - especially at 300bps!

---

TO: BS
FROM: RV
SUBJECT: BBS

As soon as I have implemented a few more things, and made the BASIC code more elegant, I am going to write that terminal program for my BBS,
I was thinking of a special command, such as EMULATE that would allow you to get special things from the BBS. I am going to include Xmodem Transfer of Forum entries, so I thought that maybe have an online editor which, when you have finished sends the forum entry in Xmodem, so no garbage (as is frequently the case). Also it would automatically go into 450 Baud, and could auto-dial the BBS (MD modems only, unless the DTR switching works on other modems). Would there be anything else? Could you use code initiated on a 8086 machine? Should there be two versions, one with math co-processor help, and one without? I'd like some more ideas on that line.....

---

TO: RV
FROM: BS
SUBJECT: BBS

I wouldn't bother with a version specially for machines with an 8087 maths co-processor, since a terminal program is unlikely to use any complex maths functions and integer operations are actually faster on the CPU than the co-processor.

I'd write the terminal emulation software for the lowest common denominator (ie: the 4.77MHz IBM PC). Since a 300 (450) baud comms program won't exactly push the PC to it's limits in terms of speed, you won't gain any real advantage by writing an AT version or whatever and you can be assured that virtually all Clone users can use the program without modification. A point though... make sure that your serial I/O software is interrupt driven if you're writing the emulator in Basic or any other high level language or you'll probably find the odd character going missing.

++++++++++++++++++++++++++++++++++++++++

TO: All
FROM: GH
SUBJECT: FAX Scanners

I know that there are dedicated plug in boards available, but would it be possible to use a standard modem to capture the output of a FAX machine and then store it in a file for later conversion. It would be possible then to use the Fax as a basic scanner. Most FAX machines have a step down mode to V21, has anyone got any information on protocalls etc ?. As there a number of different FAX machines there must be a published set of standards. Most users can not afford FAX boards for a receive only function.

---

TO: GH
FROM: DH
SUBJECT: MacFAX

The latest Apple FAX modem can send any scanned image from the Mac (TIFF format I think)...in fact it hasn't got any Scanning/printing ability of its own... just goes through the mac screen (and/or laserwriter/scanner)... ...or is that format encapsulated Postscript..

---

TO: All
FROM: JM
SUBJECT: fax programmes

I was reading an article about programmes for the PC which could allow computer users to use fax. Anybody using a programme like that. Be interested to know.

---

TO: JM
FROM: DH
SUBJECT: Re: fax programmes

You'd need a fax modem to link up to other fax machines...not just the software!...Theres one for the mac (modem and software). Also I dont think fax modems have a scanner built in (at least I dont think the Apple one does).....

---

TO: DH
FROM: JM
SUBJECT: Re: fax programmes

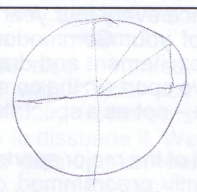
Didn't realise it was going to be that tricky. From what I gathered, all that was built in to the card. Might try and find time to reread the article.

---

AMSTRAD

# As easy as pi

by James Lawry



The first issue of *MicroBYTES* contained a program called PI-calc for the Commodore 64 by Stephen Ruddock, which calculated the value of pi, the ratio between a circle's circumference and its diameter, by means of an ingenious method involving firing random shots at a circle and a square. This method has inherent limits to its speed and accuracy, due in part to the computer hardware.

However, there is a more mathematical approach possible which yields simple formulae for pi, which can be summed by computer to give values for pi correct to a known accuracy. Since pi is an irrational number (that is, it cannot be written as an exact fraction), it is not possible to know its value exactly, but using these formulae, any desired accuracy can be obtained (in theory).

Many computers store the value of pi in their memory for use in Basic which should be accurate to as many places as used. Nevertheless it is interesting to see how these things are done – your computer calculates transcendental functions (sines, cosines, tangents and logs) by a very similar method.

In order to understand how the formula works, you must first know what a radian is. If you are familiar with radians, skip the next couple of paragraphs.

Put simply,a radian is equivalent to about 57 degrees, and there are exactly two pi radians in a full circle (i.e. about 6.283 radians). No, not even a whole number! Most Basics work in radians, i.e. if you give them an angle to take the sine of, they assume you have given the angle in radians – and there is a big difference between the sine of 1 degree and the sine of 1 radian!

If, like most rational humans, you want to use degrees, you will have to multiply by pi over 180 to convert your degree values into radians, and then divide by the same value to convert them back. Programs end up looking something like this:

```
10 AngleInDegrees = 30
20 PRINT SIN(AngleInDegrees * PI
   /180)
30 'Above line assumes built-in PI
   constant
```

If your version of Basic allows defined functions, the following workarounds can be used:

```
   DEF FNsine(angle) = sin(angle
   * pi / 180)
DEF FNcosine(angle) = cos(angle
   * pi / 180)
```

This constant need to adjust your figures to suit the computer may seem a bit inconvenient – well, it is, mostly. Luckily one or two thoughtful people who wrote the Basic for the Amstrad and a few other computers allow you to set the interpreter to work in degrees by putting the command DEG in the program (and revert to radians with the command RAD).

The only thing you really need to know for the moment is that 45 degrees equals pi/4 radians, and that 30 degrees equals pi/6 radians.

Now:
$\tan 45° = \tan \pi/4 \text{ radians} = 1.$

This means that using the inverse tan function, we can go the other way to get:

$\tan^{-1}1 = \pi/4 \text{ radians} = 45°$

Now comes the high-powered maths. (NOW it gets hard, he says!) Using an formula called Maclaurin's Theorem, it is possible to derive an equation for the inverse tan function, expressed as an infinite series like this:

$$\tan^{-1}x = x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \ldots$$

radians, of course. To calculate an inverse tan value, simply plug the number into the formula as x and keep adding terms in the series until they become insignificant, or less than the desired level of accuracy.

Now if we can use this to find the inverse tan of 1, we can obtain a value for pi/4.

This formula gives its answer in

$\pi/4 = \tan^{-1}1 = 1 - 1/3 + 1/5 - 1/7 + 1/9 - \ldots$

This gives a formula for pi by multiplying both sides of the equation by four:

$\pi = 4 - 4/3 + 4/5 - 4/7 + 4/9 - \ldots$

So it seems a simple matter to write a program to calculate pi using this formula, something like this:

```
10 a=4
20 b=1
30 p=0
40 s=1
50 oldp=p
60 p=p+s*a/b
70 b=b+2
80 s=-s
90 PRINT p
100 IF p<>oldp THEN GOTO 50
110 END
```

However, if you type this is and run it, you will find that it converges to a steady value extremely slowly. In fact, to get an estimate accurate to, say, eight decimal places, the capacity of many Basics, would take fifty million iterations! Even on a very fast microcomputer, this would take days,

## Amstrad

# Disc Copier

by Philip Young

This utility, in Amstrad Basic, will make back-ups of all protected disks currently available.

Disc copier for CPC664 and CPC6128:

```
1   '  D I S C   C O P I E R          BY PY, 1987
2   '
3   ' The only disc copier you'll ever need!
4   '
5   ' This programme uses all avaliable memory,  so
6   'will need to unplug and interfaces that are on
7   'the back of the computer before running.
8   '
10  MEMORY &1FFF:stt=&A600
11  mx=39        'Change this to 41 to copy the two extra tracks
12  strk=0       'Starting track
20  MODE 2:DIM t%(8,mx)
30  WINDOW#2,10,80,11,22
40  WINDOW#1,10,80,23,24
50  WINDOW 12,54,2,10
60  GOSUB 900    'Set up variables
70  GOSUB 350    'Get Disc information
80  st=strk      'Start track

100 GOSUB 800:md=&3C:b$="r":GOSUB 200 'Read
110 IF er<0 THEN 190
120 GOSUB 810:md=&3F:b$="w":GOSUB 200 'Write
130 IF er<0 THEN 190
140 st=tr:IF st<=mx THEN 100
150 PRINT#1,"Copied.
160 INPUT#1,"Copy another? (Y/N)";q$
170 IF ASC(UPPER$(q$+" "))=89 THEN 60
180 MODE 2:END
190 PRINT#1,"Aborted...":GOTO 160

200 POKE bufh,32
210 FOR tr=st TO st+6
220  IF tr>mx THEN RETURN
230  GOSUB 700
240  POKE stt,md
250  GOSUB 850
260  CALL rw
270  GOSUB 880
280 NEXT:RETURN

350 LOCATE 6,1
360 PRINT"  SUPER COPY 664/6128.      Version 1.1":PRINT
370 PRINT" 00000000001111111112222222223333333333
380 a$="0123456789":PRINT" "a$a$a$a$:PRINT
390 PRINT#2,"The Programme to copy all Copy Protected discs.
395 PRINT#2,
400 PRINT#2,"Before I start copying, I need some information"
410 PRINT#2,"about the disc to be copied."
420 GOSUB 800:CLS#2:WINDOW SWAP 0,2
430 LOCATE#2,strk+2,5

431 'This next part reads the format from the original disc.
432 'It handles System, Data, Vendor, CPC8256 and other disc
433 'formats with no changes necessary.
440 'A:f=PEEK(48721)AND 192
450 FOR tr=strk TO mx
460  PRINT#2,"r";CHR$(8);
470  POKE trk,tr:CALL seek
480  FOR s=0 TO 8
490   'A:t%(s,tr)=PEEK(48721)
500  NEXT
501 'Display an "!" if part of the disc is in a different format:
510  IF (t%(0,tr)AND 192)=f THEN PRINT#2,"."; ELSE PRINT#2,"!";
520 NEXT:CLS
530 PRINT"Now put in a blank disc. This disk is about
540 PRINT"to be destroyed! (Press S to Skip this step)"
550 GOSUB 810:b$="f"
560 IF ASC(UPPER$(a$+" "))=83 THEN 640

561 'Now the disc format is copied onto the other disc:
570 FOR tr=strk TO mx
580 POKE trk,tr
590  GOSUB 850
600  GOSUB 700
610  CALL fmt
620  GOSUB 880
630 NEXT
640 CLS:RETURN

700 FOR s=0 TO 8
710  POKE fd+s*4,tr
720  POKE fd+s*4+2,t%(s,tr)
730 NEXT:RETURN

800 a$="READ":GOTO 820
810 a$="WRITE"
820 IF INKEY$>""THEN 820
830 PRINT#1,"Put in disc to "a$" and press RETURN ";
840 INPUT#1,"",a$:CLS#1:RETURN
850 LOCATE#2,tr+2,6
860 PRINT#2,UPPER$(b$);
870 RETURN
880 PRINT#2,CHR$(8);MID$("*"+b$,2+(PEEK(stt)>0),1);
890 RETURN

900 s=4
910 FOR a=stt TO stt+112
920  READ a$
930  b=VAL("&0"+a$)
940  POKE a,b:s=s+b
950 NEXT
960 IF s<>8888 THEN PRINT"Error in DATA":STOP
970 rw=stt+11:seek=stt+60:fmt=stt+76
980 fd=stt+88:drv=stt+9:trk=stt+10:bufh=stt+43
990 RETURN

1000 DATA 3C,C0,07, 45,C0,07, 42,C0,07, 00,00
1010 '      READ/WR     SEEK      FORMAT  DRV TRK
1020 'Read/Write sector:
1030 DATA 21,58,A6,06,09
1040 DATA C5,56,23,23,4E,23,23,CD,24,A6,3E,FF,C1,30,03,10
1050 DATA EF,37,18,23,E5,3A,09,A6,5F,21,00,00,E5,DF,00,A6
1060 DATA E1,F5,01,00,02,09,22,2A,A6,F1,E1,C9
1070 'Seek: Move head to required track
1080 DATA ED,5B,09,A6,DF,03,A6,3E,FF,30,01,AF,32,00,A6,C9
1090 'Format: Wipe track
1100 DATA ED,5B,09,A6,21,80,A6,DF,06,A6,18,EB
1110 'Data for format:
1120 DATA ,,,2,,,2,,,2,,,2,,,2,,,2,,,2
```

## Microbee

# Auto-loader

by Bruce Norris

Selection from the menu allows any program to load. When typing the menu in, replace the example program titles with your own.

```
00100 REM ****************************
00110 REM *** AUTO LOADING PROGRAM ***
00120 REM **      By Bruce Norris     **
00130 REM **        July 1986         **
00140 REM ****************************
00145 POKE 220,20
00150 CLS:HIRES:PLOT 0,0 TO 511,0 TO 511,255 TO 0,255 TO 0,0
00160 PLOT 1,1 TO 510,1 TO 510,254 TO 1,254 TO 1,1
00170 PLOT 2,2 TO 509,2 TO 509,253 TO 2,253 TO 2,2
00180 CURS 14,8:PRINT " * * * AUTO LOADING PROGRAM * * * ":NORMAL
00190 CURS 5,15:PRINT "By Bruce Norris"
00200 CURS 45,15:PRINT"For the MicroBee"
00210 CURS 28,14:PRINT"July 1986":PLAY 0,30
00220 CLS:POKE 140,1
00230 CURS 21,2:UNDERLINE:PRINT" Pick a Program ":NORMAL
00240 CURS 14,4:PRINT"1. Boggle"
00250 CURS 14,5:PRINT"2. Circuit"
00260 CURS 14,6:PRINT"3. Tic Tac Toe"
00270 CURS 14,7:PRINT"4. Pontoon"
00280 CURS 30,4:PRINT"5. Trapdoor"
00290 CURS 30,5:PRINT"6. The Nominator"
00300 CURS 30,6:PRINT"7. Bricks"
00310 CURS 30,7:PRINT"8. Map of N.Z"
00320 CURS 14,11:PRINT "Press the number of your choice"
00330 CURS 17,12:PRINT"and press Play on the tape.";
00340 A1$=KEY$:IF A1$="" THEN 340
00350 IF A1$<1 OR A1$>8 THEN PLAY 18:GOTO 220
00360 IF A1$="1" THEN CLS:INVERSE:CURS 16,1:PRINT" * * * AUTO LOADING PROGRAM *
* * ":GOTO 440
00370 IF A1$="2" THEN CLS:INVERSE:CURS 16,1:PRINT" * * * AUTO LOADING PROGRAM *
* * ":GOTO 440
00380 IF A1$="3" THEN CLS:INVERSE:CURS 16,1:PRINT" * * * AUTO LOADING PROGRAM *
* * ":GOTO 440
00390 IF A1$="4" THEN CLS:INVERSE:CURS 16,1:PRINT" * * * AUTO LOADING PROGRAM *
* * ":GOTO 440
00400 IF A1$="5" THEN CLS:INVERSE:CURS 16,1:PRINT" * * * AUTO LOADING PROGRAM *
* * ":GOTO 440
00410 IF A1$="6" THEN CLS:INVERSE:CURS 16,1:PRINT" * * * AUTO LOADING PROGRAM *
* * ":GOTO 440
00420 IF A1$="7" THEN CLS:INVERSE:CURS 16,1:PRINT" * * * AUTO LOADING PROGRAM *
* * ":GOTO 440
00430 IF A1$="8" THEN CLS:INVERSE:CURS 16,1:PRINT" * * * AUTO LOADING PROGRAM *
* * ":GOTO 440
00440 IF A1$="1" THEN LET A1$="Boggle":GOSUB 520:LOAD"BOGGLE"
00450 IF A1$="2" THEN LET A1$="Circuit":GOSUB 520:LOAD"TRON"
00460 IF A1$="3" THEN LET A1$="Tic Tac Toe":GOSUB 520:LOAD"O & X"
00470 IF A1$="4" THEN LET A1$="Pontoon":GOSUB 520:LOAD"PONTON"
00480 IF A1$="5" THEN LET A1$="Trapdoor":GOSUB 520:LOAD"TRAP"
00490 IF A1$="6" THEN LET A1$="The Nominator":GOSUB 520:LOAD"NOMIN"
00500 IF A1$="7" THEN LET A1$="Bricks":GOSUB 520:LOAD"BRICKS"
00510 IF A1$="8" THEN LET A1$="Map of N.Z":GOSUB 520:LOAD"MAPNZ"
00520 CURS 23,3:INVERSE:PRINT "Loading:";A1$;"":NORMAL:RETURN
```

## Commodore

# Small Letters

by Antony Lyne

This program redefines the unexpanded VIC characters to the the size of the C64's. After running it, type NEW. You can then load a program such as Prowriter to use the new characters. If you would like a copy, send $4 and a blank tape to 20 Sutherland Cres, Palmerston North.

```
1 REM*****************
2 REM*SMALL LETTERS.*
3 REM*BY ANTONY LYNE*
4 REM*****************
5 POKE36869,255:POKE36879,238
8 POKE51,255:POKE52,27:POKE55,
255:POKE56,27
10 FORA=7168TO7672+7:READB:
POKEA,B:F=F+B:NEXT
11 IFF<>19146THENPRINT"DATA
ERROR CHECK ALL  DATA
STATEMENTS":END
15 PRINT"NOW TYPE IN 'NEW'"
20 DATA0,56,68,92,88,64,56,0
30 DATA0,56,68,68,124,68,68,0
40 DATA0,120,68,120,68,68,120,0
50 DATA0,56,68,64,64,68,56,0
60 DATA0,120,68,68,68,68,120,0
70 DATA0,124,64,120,64,64,124,0
80 DATA0,124,64,64,120,64,64,0
90 DATA0,56,68,64,92,68,56,0
100 DATA0,68,68,124,68,68,68,0
110 DATA0,28,8,8,8,8,28,0
120 DATA0,28,8,8,8,40,16,0
130 DATA0,68,72,112,112,72,68,0
140 DATA0,64,64,64,64,64,120,0
150 DATA0,68,108,84,68,68,68,0
160 DATA0,68,100,84,76,68,68,0
170 DATA0,56,68,68,68,68,56,0
180 DATA0,120,68,68,120,64,64,0
190 DATA0,56,68,68,84,76,62,0
200 DATA0,120,68,68,120,72,68,0
210 DATA0,56,68,120,4,68,56,0
220 DATA0,124,16,16,16,16,16,0
230 DATA0,68,68,68,68,68,56,0
240 DATA0,68,68,68,40,40,16,0
250 DATA0,68,68,68,84,108,68,0
260 DATA0,68,40,16,40,68,68,0
270 DATA0,68,68,60,4,68,56,0
280 DATA0,124,8,16,32,64,124,0
290 DATA0,112,64,64,64,64,112,0
300 DATA0,16,40,32,32,112,108,0
310 DATA0,14,2,2,2,2,14,0
320 DATA0,16,56,84,16,16,16,0
330 DATA0,0,16,32,126,32,16,0
340 DATA0,0,0,0,0,0,0,0
350 DATA0,16,16,16,16,0,16,0
360 DATA0,40,40,0,0,0,0,0
370 DATA0,40,124,40,40,124,40,0
380 DATA16,56,84,56,20,84,56,16
390 DATA0,96,100,8,16,44,76,0
400 DATA0,48,72,52,72,72,52,0
410 DATA0,8,16,0,0,0,0,0
420 DATA0,8,16,32,32,16,8,0
430 DATA0,32,16,8,8,16,32,0
440 DATA0,84,56,124,56,84,84,0
450 DATA0,16,16,124,16,16,0,0
460 DATA0,0,0,0,8,8,16,0
470 DATA0,0,0,124,0,0,0,0
480 DATA0,0,0,0,0,24,24,0
490 DATA0,24,24,0,126,0,24,24
500 DATA0,56,100,84,76,68,56,0
510 DATA0,8,24,8,8,8,28,0
520 DATA0,56,68,4,8,48,124,0
530 DATA0,56,68,24,4,68,56,0
540 DATA0,8,24,40,60,8,8,0
550 DATA0,124,64,120,4,68,56,0
560 DATA0,24,36,64,120,68,56,0
570 DATA0,124,4,8,16,32,32,0
580 DATA0,56,68,56,68,68,56,0
590 DATA0,56,68,60,4,68,56,0
600 DATA0,0,0,16,0,16,0,0
610 DATA0,0,0,8,0,8,16,0
620 DATA0,12,24,48,48,24,12,0
630 DATA0,0,0,120,0,120,0,0
640 DATA0,96,48,24,24,48,96,0
650 DATA0,56,68,24,32,0,32,0
READY.
```

# Screen to SP-400

by Anthony Head

Part 1 of the routine converts 0-255 to binary, and then compresses the binary. This needs to be run only once. Part 2 performs the dump to the printer.

```
PROGRAM #1

10 REM Screen Dump part 1
20 REM By Anthony Head
30 REM
40 DIMA$(255)
50 OPEN"BIN"FOROUTPUTAS#1
60 CLS
70 K=128:L=K
80 FORX=0TO255 STEP8
90 IFL=1THENA$(M)=A$(M)+"1":U=U-L:G
OTO160
100 A$(M)=A$(M)+"0":IFQ=0THENC=C+1:GOT
O120
110 Q=0:Z$=Z$+STR$(C):C=1:GOTO120
120 IFL=1THENZ$=Z$+STR$(C):C=0:Q=0:PRI
NTA$(M):GOTO180
130 L=L/2:GOTO90
140 NEXT
150 CLOSE:END
160 IFQ=0THENQ=1:Z$=Z$+STR$(C):C=1:GOT
O120
170 C=C+1:GOTO120
180 FORF=1TOLEN(Z$)
190 C$=MID$(Z$,F,1)
200 IFC$<>" "THENK$=K$+C$
210 NEXT
220 PRINTK$
230 PRINT#1,K$
240 Z$="":K$="":L=K:GOTO140

PROGRAM #2

10 REM Screen Dump
20 REM By Anthony Head.
30 REM
40 DIMA$(255)
50 OPEN"BIN"FORINPUTAS#1
60 FORU=0TO255
70 INPUT#1,A$(U)
80 NEXT
90 CLOSE
100 SCREEN2,2
110 LPRINT CHR$(18):LPRINT "I"
120 FORY=0TO191:LPRINT"H";:LPRINT"R0,-1
":LPRINT"I"
130 FORX=0TO255STEP8
140 A=UPEEK(INT(Y/8)*256+INT(X/8)*8+YM
OD 8)
150 FORI=1TOLEN(A$(A))STEP2
160 LPRINT"R";VAL(MID$(A$(A),I,1));",0
"
170 LPRINT"J";VAL(MID$(A$(A),I+1,1));"
,0"
180 NEXTI,X,Y
190 LPRINT"A"

NOTE. THE SCREEN DUMP PART1 ONLY HAS
TO BE RUN ONCE AND THEN CAN BE
TERMINATED...

ALSO NOTE THAT THESE SCREEN DUMP
PROGRAMS ARE INTENDED FOR USE WITH A
SEGA AND DISC DRIVE,BUT IF MODIFIED
SHOULD RUN ON THE SEGA ALONE!!.
```

WHEN RUN IT PRODUCES RESULTS LIKE THIS.

and even then rounding errors are a problem with a formula such as this. So something must be done to speed up the convergence.

There is little point in persevering with the same formula, so a new version must be devised. Again maths comes to the rescue, with the relation that:

$pi/6 = \tan^{-1}(1/SQR(3))$

Where SQR(3) denotes the square root of 3. Now we can calculate pi by multiplying the right hand side of this equation by six. Using the formula for inverse tan, we get this expression:

$$pi = 2\sqrt{3} \times \left(1 - \frac{1}{3\times3} + \frac{1}{3^2\times5} - \frac{1}{3^3\times7} + ..\right)$$

or in Sigma notation:

$$pi = 2\sqrt{3} \times \sum_{i=0}^{\infty} \frac{(-1)^i}{3^i(2+1)}$$

A program to calculate pi using this formula would look something like this:

```
10 a=2*SQR(3)
20 b=1
30 c=1
40 p=0
50 s=1
60 oldp=p
70 p=P+s*a/(b*c)
80 b=b+2
90 c=c*3
100 s=-s
110 PRINT p
120 IF p<>oldp THEN GOTO 60
130 END
```

Try running this program and see if you can get an answer the same as that stored in your computer. The following results were obtained on my Amstrad:

```
3.46410162
3.07920144
3.15618147
3.13785289
3.14260475
3.14130878
3.14167431
3.14156872
3.14159977
3.14159051
3.1415933
3.14159245
3.14159271
3.14159263
3.14159266
3.14159265
3.14159265
3.14159265
3.14159265
```

If your computer has a double precision arithmetic mode, you may be able to obtain higher accuracy using it. Of course there are still better formulae, but this one is perfectly adequate for demonstration on a micro.

But after all this, are you asking yourself: "What is the point of this? Can't I simply use what the computer has built in and type PRINT 4*ATN(1) to evaluate pi?" Sure you can, as long as you are using a language with these functions already available. But now you know just how much hard work the computer is doing every time you evaluate a sine, log or whatever.

Using Pascal on my Amstrad, I have written a set of library routines allowing a numeric type with up to 255 decimal digits. Using a formula only slightly more advanced than the program given above, it was used to calculate pi to about 250 decimal places accuracy, taking about a day – try doing that in Basic! Even that is insignificant in comparison to the NEC SX-2 supercomputer at the University of Tokyo, which took two days to calculate pi's value to 134,217,700 digits!

Oh, and if you're interested, pi = 3.14159265358979323846264338327950288419716939937510582097494459230781640628620899862803482534211706798 2.... ■

*If any Amstrad owners who use Hisoft Pascal would like a copy of the routines mentioned in the last paragraph above, contact me care of* Bits & Bytes *for details. Enquiries from users of other computers are welcome, although obviously the best I can do is give you a listing.*

# The working environment

by David Cass

The first topic to tackle in our series on the early stages of learning computers is how to get your working environment sorted out.

There are the obvious physical factors, such as work surface, good lighting to avoid eyestrain, and correct working heights and distances to avoid backache and strain in your arms. Also important is the location of your working area: which room, can you get peace and quiet, and freedom from distraction if you want it, and are there shelves or room for books or instruction manuals? A final question is: how easy is it to set up and take down your equipment quickly?

All these factors, if not right, can act as barriers between you and the computer, and sorting them out can do wonders in making you feel easier and more comfortable using your equipment, and will make you a quicker learner. Let's look at some of the ways to give yourself pain-free computing, and hope that you can move towards adopting some of them.

First, the viewing screen: if you're using a monitor, it should be about an arm's length from your face and if possible directly ahead of you, so that you don't have to twist your body. For a TV screen, a greater distance between you and the screen is advisable, dependent on screen size: bigger ones can be very overpowering close up, and glare can be a problem.

You will have to work this one out for yourself, but the best answer is to be as far away from a TV screen as you can, while still viewing OK. The best recommendation is to get a monitor, a.s.a.p!

Even with a monitor, rules are fine in theory, but in practice, such as when keyboard and computer are in the same unit or have very short connecting leads, it is not easy to get this distance, and the height of the screen, discussed below, to suit you. I solved my distance/height problem by writing to a company in England marketing extension leads to suit my computer, and the return of post airmail service solved my problem quickly and cheaply.

The top of the screen should be about level with your eyes, and the screen itself upright, or slightly back-tilted. To get to this ideal state, some people make up suitable stands from scrap wood to place under their equipment. Sure, you can use books such as old phone books, but this is precarious at the best of times, and dangerous at the worst. Take care, and don't try this with the family TV!!

How should the keyboard be positioned? There are recommended heights above the floor, usually in the region of 650-700mm, which make a good starting point. Remember, this is the height of the keyboard working surface, not what the keyboard rests on. On my Amstrad there is 70 mm difference! Another way to work out keyboard height is to sit in your comfortable seating position, let your arms hang loose, and bend your forearms at at the elbows to form a right angle. Where your hands now are is a good height for you to set your keyboard top.

## Seating position

Sitting position? Try for good lower-back support, with your feet just able to touch the ground. Office chairs can usually be adjusted to suit, some better than others, but even an everyday house chair can end up OK, perhaps with a strategically-placed cushion or pillow at your back. Try to use one with the seat sloping back very slightly, with good lower back support and some padding under the thighs.

Adjustable height, as with an office chair, is usually not feasible at home, where you have to make do, but adjusting work top height and using footrests can compensate to some extent. Footrests are actually very useful, resting tired feet, but are also good for relieving lower back pressure. You should try to sit evenly, with weight on both hips, but be prepared to change your position regularly, and get up and walk about for five minutes every so often.

Lighting is important. There must be enough for you to work in comfort, but without glare on the screen. Natural window light or artificial? It doesn't really matter, as long as there's enough and it's in the right places.

Your working surface, and book or text referral area, must be well lit. Overall ambient light can supply this, or a point source such as a single light, directed so that it illuminates without reflecting on the screen. A shade round the screen may sometimes be needed at home, where light is less easily controlled and you have to make the best of what you have. Cardboard will work, and better still if painted a dark non-reflective colour.

Screen overlays of polarised glass, or el cheapo nylon ones, can really help, particularly with a colour monitor or TV. Neutral or subdued paint on walls and work surfaces can also help to cut down the amount of stray light bouncing around,while a bright light or light colour wall behind your screen also makes things difficult for the eyes.

What room in the house is beest? Important factors to consider include: privacy, freedom from interruption, quiet, table or shelf space, room for chairs, cables, leads, availability of power point(s), suitable lighting and ventilation etc.

However, one overriding factor may be that you have to be where the TV is! If so, you really have to make the best of it, but steps can be taken to improve the situation.

Moving on to a small portable TV-based system, or better still a monitor instead of a TV, is an important first step, as it then gives you a chance of setting up a desk or table-based system, much better in every way. If this is not feasible, try to locate your working area in a corner rather than in a busy part of the room. You may be able to shift the TV to allow this, but short aerial leads and power cords may be a problem.

Ask your family not to interrupt, unless they have to: easier said than done, sometimes! Can you put up a screen between yourself and other activity in the room? Can you move lights, chairs and small tables to get yourself set up well for lighting and work space? Keep your pets out of range! A playful dog or cat can really have some fun with computer leads and power cords.

Talking of connecting leads, some useful tricks can be used: label them (colour codes) for easy set-up; use wire ties to shorten leads to avoid loose bights for folk to trip over; use a power board to tidy up power leads; and keep your equipment boxed neatly when not in use, or covered against dust, with leads coiled away.

Next month: moving on from making the best of your environment, to controlling it – set up a work station, and organise your reference books and magazines. ■

# Glossary *Part II*

**Language:** an operating code or series of phrases understood by the computer and used for carrying out the machine's functions.
**Laser printer:** a printer which uses a xerographic process of charging a plate by means of tiny points of light and transferring the image to paper.
**LCD:** liquid-crystal display.
**LED:** light-emitting diode.
**Line feed:** a control code character, the normal purpose of which is to move the cursor down one line (on screen) or move paper up one line (on printer). Does not return the cursor or print head to the left-hand margin.
**Letter-quality:** printed copy of equivalent quality to a typewriter.
**Line printer:** a printer which prints a line, rather than a character, at a time.
**Lower case:** non-capital alphabetical letters.
**Machine language:** the binary code language that the computer itself understands and which, because it needs no conversion, is executed very quickly.
**Mainframe:** an industry term referring to a large computer.
**Mass storage:** a place in which large amounts of information are stored, such as a tape or disk, with slower access time than main memory.
**Megabyte (or Mb):** a million bytes.
**Megaflop:** a spectacular failure involving large sums of money, eg JBL or SecuritiBank.
**Memory:** the part of the computer that stores information and instructions, each piece of which is assigned to a unique location within the memory.
**Menu:** a list of options within a program that allows the operator to choose which part to interact with (see Interactive). The various options are displayed on a screen and the operator chooses one.
**Microcomputer:** a small computer of desktop or laptop size based on a microprocessor.
**Microprocessor:** the CPU or 'intelligent' part of a microcomputer, contained within a single silicon chip and controlling all the functions and calculations.
**Minicomputer:** originally a computer that went with a single equipoment cabinet, and now a machine between a microcomputer and a mainfrane, although the boundaries between the mini and the classes on either side are becoming increasingly blurred.
**MIPS:** millions of instructions per second, an indication of CPU speed.
**Modem:** modulator-demodulator, an instrument that connects a computer to a telephone and allows it to communicate with another computer over the telephone lines.
**Monitor:** the television-like screen used for display.
**Motherboard:** the main circuit board which has other circuit boards attached to it.
**Mouse:** a device about the size of a pack of cards, attached to the computer by a cable (its 'tail') and used for communicating with the computer by hand movements.
**MS-DOS:** Microsoft disk operating system, the current industry standard for 16-bit computers used in businesses etc.
**Multi-user:** a system in which several users share one central computer's processing power, memory and peripherals, often using 'dumb' terminals for their own workstations (compare Network).
**Network:** a group of computers, each more or less capable of running on its own, linked together by data cable or similar connection.
**Operating system:** the group of programs which the computer needs itself to operate other programs.
**Optical disk:** a form of disk storage which uses light beams reflected off the surface rather than magnetic read/write. See WORM.
**Output:** the information a computer displays, prints or transmits after it has processed the input. See Input and I/O.
**Parallel interface:** a type of communications interface used mainly for printers, sending a whole character of data down (commonly) 8 lines, 1 bit down each line. The most common type is the Centronics interface.
**Parity bit:** a wound inflicted by a kea.
**Pascal:** a high-level language incorporating the form of structured programs.
**PEEK:** a command that examines a specific memory location and returns the value there. See POKE.
**Peripheral:** an external input or output device, such as a disk drive, printer, terminal etc.
**Pixel:** picture element, the point on a screen in graphics.
**Plotter:** a printing device which guides one or more pens across paper in two axes to reproduce graphs and diagrams.
**POKE:** a command that inserts a value into a specific memory location. See PEEK.
**Printer:** also a printing device, often used for printing printout.
**Program:** a set or collection of instructions written in a particular programming language which causes a computer to carry out or execute a given operation.
**RAM:** random access memory, the very fast memory inside the computer used when processing programs and information. Not used for permanent storage because RAM is lost when the power is turned off.
**Real time clock:** a battery-powered clock which keeps track of the time and date when the computer is switched off. The battery runs down when least expected.
**Resolution:** a measure of clarity of the monitor, being the number of points (pixels) on the screen.
**ROM:** read only memory, in which information or instructions have been permanently fixed.
**SCSI:** small computer systems interface, yet another interface standard.
**Serial interface:** a type of communications interface used for a wide variety of purposes (printers, terminals, telephone connections etc) and using a minimum of two wires, sending the data one bit at a time down one wire. The most common type is the RS232C.
**Sheet feed:** a type of paper feed system normally used for high-quality document printers, allowing one sheet of paper at a time from a bin into the printer friction rollers.
**Software:** see Program.
**Sprocket feed:** see Tractor feed.
**System:** a collection of hardware and software where the whole is greater than the sum of the parts.
**Terminal:** a device for communicating with a computer, usually comprising a keyboard and monitor or printer.
**Thermal printer:** an output device which uses heat to form characters on heat-sensitive paper.
**Timesharing:** the sharing of one computer by a number of users.
**Tractor feed:** a type of paper feeding mechanism for printers, with special computer paper with holes along both sides being gripped by tractors or sprockets.
**User:** computer operator.
**User friendly:** a system which is easy to use and understand. Also describes a user whose system hasn't crashed lately.
**User group:** an group of people who meet in order to exchange information etc about a common computer or system.
**WAN:** wide area network, a group of computers linked up over a larger area than a LAN. See LAN and Network.
**WORM:** write once, read many times. A storage device, often an optical disk, on which permanently-stored information can be read but not amended.
**WP:** word processor, a computer system used for the entry, manipulation and storage of text.
**WYSIWYG:** 'what-you-see-is-what-you-get. WIPWIS (which is precisely what it says).